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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/577,158	05/24/2000	Tsuyoshi Kowaka	192210US0	4954

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EXAMINER

WILSON, DONALD R

ART UNIT	PAPER NUMBER
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1713

DATE MAILED: 10/03/2002

15

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/577,158

Applicant(s)

KOWAKA ET AL.

Examiner

D. R. Wilson

Art Unit

1713

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 06 September 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 29,31-40,43-45,47-50 and 52-60 is/are pending in the application.
- 4a) Of the above claim(s) 29,31,32,38-40,43,44,47-50 and 52-54 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 33-37,45 and 55-60 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____

DETAILED ACTION

Status of Application

1. The request filed on 9/6/02 for a Continued Prosecution Application (CPA) under 37 CFR 1.53(d) based on parent Application No. 09/577,158 is acceptable and a CPA has been established. An action on the CPA follows.
2. The restriction requirement as set forth in paper No. 7 remains in effect. As applicant's state that the CPA is being filed to obtain examination of the Group II inventions, now Claims 33-37, 45 and 55-60, these are the claims now under consideration. Claims 29, 31-32, 38-40, 43-44, 47-50 and 52-54 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention.
3. Applicant also stated that to the degree that the election of species requirement is maintained that Claims 55-60 are directed to the elected species. The Examiner did not find this sufficient and asked applicant to elect species of the alcohol containing solvent in both the first and second stage saponification processes. During a telephone conversation with Mr. Harris A. Pitlick on 9/30/02 a provisional election was made with traverse to prosecute the invention of the species wherein the alcohol containing solvent in both the first and second stage process is a mixture of methanol and dimethyl sulfoxide. Affirmation of this election must be made by applicant in replying to this Office action. All claims under consideration appear to be generic to this election.

Response to Amendment

4. Applicant's amendment filed 9/12/02, 1997 has been fully considered with the following results.
5. As applicant has requested that the Group II inventions now be examined, Group I claims are withdrawn from consideration and the outstanding rejection of Claims 29, 31-32 and 47-50 are in abeyance. However, if the Group I claims should again come into consideration those rejections will be reinstated.

Previously Cited Statutes

6. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office Action.

Art Unit: 1713

Claim Rejections - 35 USC § 103

7. **Claims 33-37 are rejected under 35 U.S.C. 103(a) as being unpatentable over**
- JP'807 or Sato, each in view of Morrison, Yanai and Schindler, or**
 - Imai in view of Morrison, Yanai and Schindler, optionally in view of Examiner's**

Notice:

The citations to JP'807 below are to the PTO English translation of JP'807.

8. JP'807 discloses saponification of a polyvinyl ester such as polyvinyl acetate (PVAc) having a viscosity of at least 1.4 dl/g, in a solvent among which dimethyl sulfoxide (DMSO) is specified, or in admixture with methanol (pages 6-7). The presence of a saponification catalyst including alcoholates of alkali metals, of which sodium methoxide would have been an obvious example, is also taught (page 8, 2nd paragraph). Example 1 exemplifies a saponification of 20 pbw of PVAc in a mixture of 180 pbw of DMSO and 37 pbw of methanol (9.2 wt.% PVAc). This exemplifies a mole ratio of alcohol with respect to polyvinyl alcohol of about 3.5. However, some variation around that exemplified would have been obvious to one of ordinary skill in the art. Example 2 exemplifies saponification of a 180 pbw of a 22 wt.% solution of PVAc in methanol admixed with 178 pbw of dimethylformamide (11.1 wt.% PVAc).
9. Sato discloses processes for producing polyvinyl alcohols (PVOHs) containing various functional groups, which includes a hydrolysis step of the precursor polyvinyl ester. It is specifically disclosed that "[a]ny ordinary hydrolysis of polyvinyl esters that uses a basic or acid catalyst may apply to the present invention." An example of said hydrolysis includes using sodium methylate (methoxide) as the basic catalyst, an alcoholic solvent such as methanol, and in order to improve solubility of the vinyl ester, the presence of an appropriate solvent among which DMSO is specifically named (col. 5, lines 19-37). Vinyl acetate polymers are preferred as is evidenced by the examples. Thus, Sato discloses that the hydrolysis of PVAc in solvents such as a mixture of DMSO and methanol with sodium methylate catalyst is ordinary, but is deficient in not disclosing that the saponification reaction is carried out while distilling off the carboxylic acid ester reaction product. A number of the Examples in Table 4 exemplify hydrolysis conditions wherein the ratio of moles of alcohol with respect to polyvinyl alcohol are within the limits of instant Claim 33.

Art Unit: 1713

10. Imai discloses an improved process for producing PVOH from PVAc by reaction in an organic sulfoxide solvent (col. 1, lines 60-68). The reactions disclosed include base catalyzed alcoholysis by methanol in a dimethyl sulfoxide solution of polyvinyl acetate (col. 3, lines 49-69, and Examples 3-5). However, Imai uses a large excess of solvent.

11. JP'807, Sato and Imai are deficient in not disclosing that the saponification reaction is carried out while distilling off the carboxylic acid ester reaction product, and that the saponification is carried out in two stages. Imai is also deficient in regards to the mole ratio of alcohol solvent to polyvinyl alcohol.

12. It is a well established that transesterification reactions are equilibrium reactions, and that in order "--- to shift the equilibrium to the right, it is necessary to use a large excess of the alcohol whose ester we wish to make, or else to remove one of the products from the reaction mixture" (Morrison pp 682-683). Morrison also teaches in the same place that the second approach is the better one when feasible, since in this way the reaction can be driven to completion. Yanai makes a similar disclosure in a process of saponifying ethylene-vinyl acetate copolymers in mixtures of DMSO and methanol. It is taught that "--- for the purpose of increasing the saponification degree to shift the saponification equilibrium to the formed product side", and that "[f]or this reason it is desired to efficiently distill off the ester used, e.g., methyl acetate" (col. 10, lines 11-32). It is also well known to use multiple stages of saponification in the methanolysis of polyvinyl acetate in order to achieve high degrees of conversions as for instance is disclosed by Schindler (col. 1, lines 45-50). This is similar to the well known method of multiple solvent extractions with small volumes as opposed to a single extraction with a large volume of solvent in order to more efficiently overcome the equilibrium for extractant which exists between the medium being extracted and the solvent. It would have been obvious to one of ordinary skill in the art in the saponification process taught by JP'807, Satoh or Imai, to use a higher concentration of PVAc in the alcoholysis reaction and to distill off the methyl acetate formed, such as is taught by either Morrison or Yanai, in order to efficiently increase the degree of saponification, and/or to reduce the amount of alcohol required to achieve high degrees of saponification. It would also have been obvious to use a well known multistage process such as disclosed by Schindler, i.e., repeating the saponification process, which would have the same advantage of increasing the degree of saponification, and/or to reducing the amount of

Art Unit: 1713

alcohol required to achieve high degrees of saponification. Lacking a showing of criticality for a combined process of distilling off the methyl acetate and multiple saponification stages, it would have been *prima facie* obvious to use a combination of process steps known to be useful for the same purpose of increasing the degree of saponification obtained. Higher concentrations of PVAC would have been expected to include ratios within the limits of instant Claim 33⁵⁵. It would also have been obvious to commence distillation after an equilibrium is approached, i.e., after the methyl acetate had formed. Degrees of saponification in the primary saponification reaction of the first stage such as are claimed would be expected to be below the transesterification equilibrium value, and the degrees of saponification would be expected to advance with distillation of the methyl acetate formed and in a second stage saponification. The degrees of saponification in Claims 34-99% would have been obvious from the steps employed which are known in the art to advance the transesterification process.

13. Although JP'807 doesn't appear to teach reactions wherein the concentration of the polyvinyl alcohol polymer is 10 wt.% or more in a methanol/diethyl sulfoxide solvent mixture, some degree of latitude in what has been exemplified. Further, it would have been obvious to one of ordinary skill in the art to minimize the amount of solvent used in order to decrease the costs associated with recovering solvents. {Sato exemplifies hydrolysis reactions in the examples wherein the concentration of the functionalized vinyl acetate polymer is above 10 wt.% PVOH. As the hydrolysis reaction has been equated to the ordinary hydrolysis of PVAc, it would have been obvious to one of ordinary skill in the art that such concentration are known to be used in the hydrolysis reactions disclosed for PVAc.} Imai is also deficient in not disclosing sodium methoxide as the basic catalyst. However, it would be inherent that at least some minimal quantity of sodium methoxide would be present in equilibrium with the sodium hydroxide catalyst used. Alternatively, the Examiner takes Notice that the use of sodium methoxide as the basic catalyst in the alcoholysis of PVAc with methanol is well known and would have been obvious to use with the expectation of equivalent results.

14. **Claims 33-37, 45 and 55-60 41-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over:**

Art Unit: 1713

a. JP'807 or Sato, each in view of Morrison, Yanai and Schindler as applied to Claims 33-37 above, or

b. Imai in view of Morrison, Yanai and Schindler, optionally in view of Examiner's Notice as applied to Claims 33-37 above

and further in view of Admissions by Applicant and Yanai, and still further in view of Standiford, King or Ishiwa.

15. The above stated prior art rejections are deficient in not teaching carrying out the primary saponification reactions in a kneader mixer, the secondary saponification reaction for the first stage in a tower reactor, and the secondary reaction in a second stage in a shell and tube evaporator. First, it would have been obvious to one of ordinary skill in the art that in each of the stages of the saponification reactions taught and/or obvious over (a) JP'807 or Sato, each in view of Morrison or Yanai, or (b) Imai in view of Morrison and Yanai, optionally in view of Examiner's Notice, that it would first be necessary to thoroughly mix the reactants, i.e., the polymer, solvent mixture and catalyst. As admitted to by applicant kneader mixers are well known in the art of polymer technology to be useful for this purpose, and therefore would have been a known and obvious choice to use for this purpose.

16. As discussed above, Yanai teaches a process of saponifying ethylene-vinyl acetate copolymers in mixtures of DMSO and methanol, wherein "--- for the purpose of increasing the saponification degree to shift the saponification equilibrium to the formed product side, --- it is desired to efficiently distill off the ester used, e.g., methyl acetate" (col. 10, lines 11-32, and col. 14, lines 45-52). It is specifically taught to do this in a column system with a distillation column, which would be a tower reactor as defined by applicant. It would have been obvious to one of ordinary skill in the art to use the column system as described by Yanai for the efficient removal of methyl acetate and shifting the transesterification equilibrium to the formation of polyvinyl alcohol in the processes taught and/or obvious over (a) JP'807 or Sato, each in view of Morrison or Yanai, or (b) Imai in view of Morrison and Yanai, optionally in view of Examiner's Notice, because the column system is taught to be useful for such a process.

17. Shell and tube evaporators are the most widely used type of film evaporator, among which one version is the falling film type (Standiford, pp. 965-968). Secondly, it is well known in the field of polymer

Art Unit: 1713

technology to employ film type evaporators in order to remove volatiles and/or to shift the equilibrium in condensation reactions. For example, in the preparation of polyesters it is known to remove ethylene glycol under reduced pressure in order to advance the degree of polymerization, i.e., shifting the equilibrium to the formation of polymer (King, col. 7, line 63 to col. 8, line 14). Example 6 exemplifies the use of a falling film evaporator for removing the ethylene glycol to complete the polymerization. Similarly, in the synthesis of polycarbonate by the transesterification of a dihydroxy compound and a diester carbonate, a thin film evaporator is used to remove the by product alcohol and advance the degree of polymerization (Ishiwa, col. 14, lines 31-42). It would also have been obvious to one of ordinary skill in the art to use a shell and tube type evaporator for the removal of volatile methyl acetate in either stage of the saponification process taught and/or obvious over (a) JP'807 or Sato, each in view of Morrison or Yanai, or (b) Imai in view of Morrison and Yanai, optionally in view of Examiner's Notice, as film type evaporators are well known to be used in the field of polymer technology for removing volatiles in order to shift the equilibrium in ester forming reactions as for instance is taught by King and Ishiwa, and because shell and tube type reactors are well known and commonly used film type evaporators as for instance is disclosed by Standiford. However, it would also have been obvious to one of ordinary skill in the art to use the column system as taught by Yanai in the first stage wherein a more selective removal of methyl acetate would be desirable and possible due to the multiple stages and reflux ratios possible therein (see Yanai col. 10, lines 29-32). While film evaporators have greater efficiency for removing volatiles they differ from distillation in that multiple stages with reflux ratios is not effected, i.e., it is a single stage (plate) distillation process (see Standiford, p 959).

Art of Interest/Technological Background

18. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Kamachi discloses the preparation of non-elected species of the invention in DMSO/methanol solvent and may be used as a basis of future obviousness rejections.

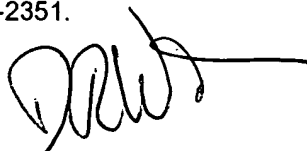
Future Correspondence

Any inquiry concerning this communication or earlier communications from the examiner should be directed to D. R. Wilson whose telephone number is 703-308-2398.

Art Unit: 1713

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David Wu can be reached on 703-308-2450. The fax phone numbers for the organization where this application or proceeding is assigned are 703-305-5408 for regular communications and 703-305-3599 for After Final communications. The unofficial direct fax phone number to the Examiner's desk is 703-872-9029.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 308-2351.

A handwritten signature in black ink, appearing to read 'D. R. Wilson', with a long horizontal stroke extending to the right.

D. R. Wilson
Primary Examiner
Art Unit 1713